Adaptive co-management for conservation of the Llancahue watershed in Southern Chile

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Short title: Community-based conservation: The case of the Llancahue watershed, Valdivia, Chile.

Key Message: Involving institutional and local stakeholders for adaptive co-management of a watershed can lead to more sustainable water provision, conservation of an old-growth forest and improved living conditions of the local community.

Reviewer: Pablo Donoso, Michelle Moorman, Mauro E. González.

Suggested citation: TEEBcase (2013): Adaptive co-management for conservation of the Llancahue watershed in Southern Chile, by Karla Locher, available at: TEEBweb.org.

Keywords: Adaptive co-management, decentralized conservation, stakeholders, watershed, temperate old-growth forests.

1. What was the problem?

The Llancahue Watershed, located in the south of Chile, covers 1,270 ha and provides important ecosystem services to the local population - including biodiversity protection, peri-urban parks for recreation, clean water, as well as 80% of the water supply for the local city of Valdivia. The area is part of the Valdivian ecoregion which protects approximately 700 ha of old-growth Valdivian temperate forest, a noted biodiversity hotspot and threatened ecosystem. Llancahue is surrounded by the Lomas del Sol community, which comprises of 23 families who earn a living mainly from selling charcoal and firewood harvested from the protected area. The Lomas del Sol community's activities of illegal logging and cattle grazing pose a serious threat to the protected area.

The government of Chile has owned this area since 1929, with the duty to protect its water supply, but the area was almost abandoned, in the sense that the lack of resources dedicated to its protection and maintenance and the failure to consider the necessities of the adjacent communities, e.g. stakeholders' participation, lead to a degradation of the natural resources that the government had the mandate to protect.

2. Which approach was taken?

By September 2008, the illegal logging and grazing were threatening the integrity of the ecosystem functions provided by the watershed. Based on this problem the Government of Chile granted the management concession for the Llancahue watershed to the University Austral de Chile (UACh) for a period of 20 years, with the mandate to develop a peri-urban park for Valdivia (1,270 ha). This concession gives to the UACh the mandate to administrate the protected area. A steering committee accompanies the UACh and supports decision making. This committee includes five public institutions, one NGO (Agrupación de Ingenieros Forestales por el Bosque Nativo - AIFBN), the Municipality of Valdivia, and the Lomas del Sol community of 23 campesino[1] families. The aim was to provide better management of the watershed and benefit the city of Valdivia by converting Llancahue into a recreational and educational space, protecting and improving the ecosystem services provided by the watershed through a multistep process. This process was to include the stakeholder's views and an ecosystem plan for the watershed that promotes an adaptive co-management approach, in order to balance the multiple societal demands and ecosystem functions within the watershed.

The specific goals of this agreement were to (1) protect the quantity and quality of the water supply; (2) conserve biodiversity in the watershed; (3) encourage public use through outdoor education, ecotourism, and incorporate the local rural community Lomas del Sol; (4) conduct scientific research on ecosystem processes; and (5) manage and finance the project through sustainable forest management (Donoso et al 2005).

The university received the concession without any financial assistance. In order to finance the initiative it was necessary to apply for various public research grants, mainly with a focus on topics related to sustainable forest management and community development. Private donations or a management fee that could be added to the water bill were considered as alternatives for financing, but have not yet been implemented.

The focus of this initiative is to develop an adaptive multi-stakeholder partnership co-management, associated with decentralized conservation. The concrete plan is to creatively

[1] Campesino is a Spanish word that means rural peasant.

and strategically use stakeholder's resources and expertise, in order to find economic alternatives to the current situation without compromising biodiversity and watershed conservation (in terms of quality and quantity). (Moorman et al 2009, 2013).

3. What ecosystem services are considered and how?

The Llancahue watershed provides important goods and ecosystem services to the local community, such as water quality regulation, water flow regulation, forest products, carbon sequestration, preservation of habitats, and biodiversity. Accordingly, the project takes into account the ecosystem service supply-demand assessment, linking directly the integrity of the ecosystem and human wellbeing in the human–environmental systems. It is necessary to understand the contextual uniqueness of this individual socio-ecological system and to transfer this knowledge to an adaptive co-management. Stakeholder participation and the biophysical information available for the area made it possible to define priority areas:

1) Primary forests, including the old-growth forests and lands surrounding the main water course of the watershed;
2) Land intensively used and degraded in the past subjected to restoration;
3) Intensively used land for public use located where the public road connects to the Llancahue watershed;
4) Extensively used land, including area for trekking, restoration and management zones, connected to the old-growth forests; and
5) Management of areas neighboring the Lomas del Sol community covering secondary forests.

The areas with secondary forest were managed by the Lomas del Sol community and controlled by the university and the NGO in order to obtain firewood and charcoal without a decrease in the quality and quantity of the forest richness. Different research projects (hydrological, vegetation, etc.) were also implemented with the aim of improving the knowledge about the watershed area.

4. What methodology was applied?

Assessing stakeholder interests and perspectives allow for the implementation of decentralized conservation programs with more effective management, better acceptance of management actions, environmental and social understanding, trust between stakeholders, lower costs for enforcement, and better public awareness (Moorman et al 2009). In order to develop community-based conservation in the watershed, the first step was to determine the

attitudes of local people toward conservation initiatives, and identify potential ways the local communities could benefit from the conservation area (Moorman et al 2013). Through key informants and snowball sampling, 45 potential partner organizations were identified. The information was collected using mixed methods approach with combination of semi-structured interviews (n: 70), formal meetings (n: 3), focus group discussions (n: 5), documentation of informal interactions, and observations were used, to conduct the stakeholders analysis. The stakeholders' groups can be divided into two major categories: the local campesino* community and the institutional actors. The local campesino community includes the members of Lomas del Sol community, who live close to the area of interest. The institutional stakeholders include 5 governmental agencies, the AIFBN NGO, private industry, and the university.

The stakeholder analysis showed similarities in the opinions of both groups, where most of them agree on maintaining and conserving this area. It was agreed that an integrative management approach would provide more value to the area, as it would recognize the importance of livelihoods for current and future generations. The community members revealed a big interest in protecting the area but at the same time were concerned they were not ready for this change. These concerns were related to who would be taking the financial, personnel and legal risks, and what their role and benefits would be realistically, given their current lack of tools and support. They hoped that it would create alternative livelihoods for them, such as training, education and better services, roads, and electricity. The institutional stakeholders ranked the protection of the water supply as their first and the conservation of old-growth forest as second priority, with concern about the impacts that could happen in the watershed due to the recreational use.

An important point is that many of the stakeholders have the belief that conservation and economic development need to go hand in hand, leading to their search for a new conservation model that promotes economic development goals in the rural sector. They recognized the lack of government mechanisms to reduce pressures on the natural resources in the country. For this reason, they were searching for an alternative partnership scheme to improve protected area management by enhancing the flow of resources in the watershed, in a bottom-up perspective.

5. Current state of the initiative and lessons learned

This initiative has contributed to set a base in the private-public cooperation between the private University Austral de Chile and the Government of Chile. This kind of initiative has previously not been common in terms of natural resources management but could represent a large potential for future projects. The adaptive co-management has evolved in a positive way, with several projects currently running under this initiative, considering different aspects of the watershed management. One of the most important implementations, in order to improve the quality of life of the Lomas del Sol community in a sustainable way, is the steady yearly incomes obtained from the sale of firewood from the secondary forest management. In addition, the University Austral de Chile recently received a forest research grant, which is used to conduct research in Llancahue and provides another mechanism for financing the initiative. Also the other stakeholders, such as local NGOs, received a small grant that allowed them to provide agricultural training to the Lomas del Sol community, and helped women in the community to build greenhouses and compost piles. This initiative is only the first example showing that it is possible to implement a decentralized conservation management in the country by transferring the power to the local and regional actors, in particular the communities. The participatory process is fundamental to promoting awareness and sustainable use of local resources, with multiple benefits not only to local people, but also to the conservation of the biodiversity and the services that ecosystems provide.

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